

Amendments to the Claims:

This listing of claims replaces all prior versions, and all prior listings, of claims in the application.

Listing of Claims:

1. (currently amended) A fabrication method of a semiconductor integrated circuit device, comprising the steps of:
  - (a) depositing a silicon nitride insulating film over a semiconductor substrate;
  - (b) depositing a silicon oxide insulating film over said silicon nitride insulating film; and
  - (c) subjecting said semiconductor substrate to a plasma etching treatment using an etching gas containing a fluorocarbon gas, oxygen and a dilution gas to process said silicon oxide insulating film,  
wherein a residence time of the etching gas within an etching chamber is set at 50 to 700 ms, and  
wherein a temperature of said semiconductor substrate ~~being during the plasma etched-etching treatment~~ ranges from ~~60-100°~~ to ~~140°C~~ 130°C.
2. (currently amended) A method according to Claim 1, wherein a pressure within the etching chamber during ~~the course of the~~ plasma etching treatment ranges from 0.7 to 7 Pa.

3. (original) A method according to Claim 1, wherein a total flow rate of the etching gas passed into the etching chamber ranges from 200 to 1000 cm<sup>3</sup>/minute.

4. (original) A method according to Claim 1, wherein a total flow rate of the etching gas passed into the etching chamber is at 700 cm<sup>3</sup>/minute or over.

5. (original) A method according to Claim 1, wherein a pressure within the etching chamber during the plasma etching ranges from 1.3 to 4 Pa, and the total flow rate of the etching gas passing into the etching chamber is at 700 cm<sup>3</sup>/minute or over.

6. (original) A method according to Claim 1, wherein a flow rate of said dilution gas is larger than the flow rates of said fluorocarbon gas and oxygen.

Claims 7 and 8 (canceled)

9. (original) A method according to Claim 1, wherein a plasma density during the plasma etching ranges from  $1 \times 10^{10}$  to  $1 \times 10^{13}/\text{cm}^3$ .

10. (original) A method according to Claim 1, wherein a plasma density during the plasma etching ranges from  $1 \times 10^{10}$  to  $1 \times 10^{12}/\text{cm}^3$ .

11. (original) A method according to Claim 1, wherein said fluorocarbon gas is made of  $C_5F_8$ , and said dilution gas is made of argon.
12. (original) A method according to Claim 11, wherein a flow rate of said argon gas ranges from 200 to 1000  $cm^3$ /minute.
13. (previously presented) A method according to Claim 11, wherein a flow rate of said argon gas ranges from 400 to 800  $cm^3$ /minute.
14. (original) A method according to Claim 11, wherein a ratio in flow rate between the oxygen and  $C_5F_8$  (oxygen/ $C_5F_8$ ) ranges from 0.8 to 1.5.
15. (original) A method according to Claim 11, wherein a ratio in flow rate between the oxygen and  $C_5F_8$  (oxygen/ $C_5F_8$ ) ranges from 1 to 1.2.
16. (original) A method according to Claim 11, wherein a partial pressure of  $C_5F_8$  ranges from 0.02 to 0.2 Pa.
17. (original) A method according to Claim 11, wherein a partial pressure of  $C_5F_8$  ranges from 0.04 to 0.1 Pa.
18. (currently amended) A fabrication method of a semiconductor integrated circuit device, comprising the steps of:
- (a) depositing a silicon nitride insulating film over a semiconductor substrate;

(b) depositing a silicon oxide insulating film over said silicon nitride insulating film; and

(c) subjecting said semiconductor substrate to a plasma etching treatment using an etching gas containing a fluorocarbon gas, oxygen and a dilution gas to process said silicon oxide insulating film,

wherein a residence time of the etching gas within an etching chamber is set at 50 to 350 ms, and

wherein a temperature of said semiconductor substrate ~~being during~~  
~~the plasma etched-etching treatment~~ ranges from ~~60-100°~~ to ~~140°C~~130°C.

19. (currently amended) A fabrication method of a semiconductor integrated circuit device, comprising the steps of:

(a) depositing a silicon nitride insulating film over a semiconductor substrate;

(b) depositing a silicon oxide insulating film over said silicon nitride insulating film; and

(c) subjecting said semiconductor substrate to a plasma etching treatment using an etching gas containing a fluorocarbon gas, oxygen and a dilution gas to process said silicon oxide insulating film,

wherein a residence time of said etching gas within an etching chamber is set at 100 to 200 ms, and

wherein a temperature of said semiconductor substrate ~~being during~~  
~~the plasma etched-etching treatment~~ ranges from ~~60-100°~~ to ~~140°C~~130°C.

20. (currently amended) A fabrication method of a semiconductor integrated circuit device, comprising the steps of:

(a) depositing a silicon nitride insulating film over a semiconductor substrate;

(b) depositing a silicon oxide insulating film over said silicon nitride insulating film; and

(c) subjecting said silicon oxide insulating film to a plasma etching treatment using an etching gas containing a fluorocarbon gas, oxygen and a dilution gas to process said silicon oxide insulating film,

wherein a pressure within an etching chamber during the plasma etching treatment ranges from 0.7 to 7 Pa, and a total flow rate of the etching gas passed into said etching chamber is 700 cm<sup>3</sup>/minute or over, and

wherein a temperature of said semiconductor substrate ~~being during~~ the plasma etched-etching treatment ranges from 60-100° to 440°C130°C.

21. (currently amended) A fabrication method of a semiconductor integrated circuit device, comprising the steps of:

(a) depositing a silicon nitride insulating film over a semiconductor substrate;

(b) depositing a silicon oxide insulating film over said silicon nitride insulating film; and

(c) subjecting said silicon oxide insulating film to a plasma etching treatment using an etching gas containing a fluorocarbon gas, oxygen and a dilution gas to process said silicon oxide insulating film,

wherein a pressure within said etching chamber during the plasma etching ranges from 1.3 to 4 Pa, and a total flow rate of said etching gas passed into the etching chamber is at 700 cm<sup>3</sup>/minute or over, and

wherein a temperature of said semiconductor substrate ~~being during~~  
~~the plasma etched-etching treatment~~ ranges from ~~60-100°~~ to 140°C 130°C.

22. (currently amended) A fabrication method of a semiconductor integrated circuit device, comprising the steps of:

(a) depositing a silicon oxide insulating film over a patterned silicon nitride film with a doped polycrystalline silicon plug over a semiconductor substrate;

(b) forming a hard mask over said silicon oxide insulating film; and

(c) subjecting said semiconductor substrate to a plasma etching treatment through the hard mask as an etching mask using an etching gas containing a fluorocarbon gas, oxygen and a dilution gas to process said silicon oxide insulating film, so as to form a hole in said silicon oxide insulating film down to the patterned silicon nitride film in such a manner that an upper surface of the doped polycrystalline silicon plug is exposed,

wherein a residence time of the etching gas within an etching chamber is set at 50 to 700 ms.

23. (original) A method according to Claim 22, wherein a pressure within the chamber during the plasma etching ranges from 0.7 to 7 Pa.

24. (original) A method according to Claim 22, wherein a total flow rate of the etching gas passed into the etching chamber ranges from 200 to 1000 cm<sup>3</sup>/minute.

25. (original) A method according to Claim 22, wherein a total flow rate of the etching gas passed into the etching chamber is at 700 cm<sup>3</sup>/minute or over.

26. (original) A method according to Claim 22, wherein a pressure within the etching chamber during the plasma etching ranges from 1.3 to 4 Pa, and the total flow rate of the etching gas passing into the etching chamber is at 700 cm<sup>3</sup>/minute or over.

27. (original) A method according to Claim 22, wherein a flow rate of said dilution gas is larger than the flow rates of said fluorocarbon gas and oxygen.

28. (original) A method according to Claim 22, wherein a plasma density during the plasma etching ranges from  $1 \times 10^{10}$  to  $1 \times 10^{13}/\text{cm}^3$ .

29. (original) A method according to Claim 22, wherein a plasma density during the plasma etching ranges from  $1 \times 10^{10}$  to  $1 \times 10^{12}/\text{cm}^3$ .

30. (original) A method according to Claim 22, wherein said fluorocarbon gas is made of C<sub>5</sub>F<sub>8</sub>, and said dilution gas is made of argon.

31. (original) A method according to Claim 30, wherein a flow rate of said argon gas ranges from 200 to 1000 cm<sup>3</sup>/minute.

32. (original) A method according to Claim 30, wherein a flow rate of said argon gas ranges from 400 to 800 cm<sup>3</sup>/minute.

33. (original) A method according to Claim 30, wherein a ratio in flow rate between the oxygen and C<sub>5</sub>F<sub>8</sub> (oxygen/C<sub>5</sub>F<sub>8</sub>) ranges from 0.8 to 1.5.

34. (original) A method according to Claim 30, wherein a ratio in flow rate between the oxygen and C<sub>5</sub>F<sub>8</sub> (oxygen/C<sub>5</sub>F<sub>8</sub>) ranges from 1 to 1.2.

35. (original) A method according to Claim 30, wherein a partial pressure of C<sub>5</sub>F<sub>8</sub> ranges from 0.02 to 0.2 Pa.

36. (original) A method according to Claim 30, wherein a partial pressure of C<sub>5</sub>F<sub>8</sub> ranges from 0.04 to 0.1 Pa.

37. (currently amended) A fabrication method of a semiconductor integrated circuit device, comprising the steps of:

(a) depositing a silicon oxide insulating film over a patterned silicon nitride film with a doped polycrystalline silicon plug over a semiconductor substrate;

(b) forming a hard mask over said silicon oxide film; and



(c) subjecting the semiconductor substrate to a plasma etching treatment through the hard mask as an etching mask using an etching gas containing a fluorocarbon gas, oxygen and a dilution gas to process said silicon oxide insulating film, so as to form a hole in said silicon oxide insulating film down to the patterned silicon nitride film in such a manner that an upper surface of the doped polycrystalline silicon plug is exposed,

wherein a residence time of the etching gas within an etching chamber is set at 50 to 350 ms.

38. (currently amended) A fabrication method of a semiconductor integrated circuit device, comprising the steps of:

(a) depositing a silicon oxide insulating film over a patterned silicon nitride film with a doped polycrystalline silicon plug over a semiconductor substrate;

(b) forming a hard mask over said silicon oxide film; and

(c) subjecting the semiconductor substrate to a plasma etching treatment through the hard mask as an etching mask using an etching gas containing a fluorocarbon gas, oxygen and a dilution gas to process said silicon oxide insulating film, so as to form a hole in said silicon oxide insulating film down to the patterned silicon nitride film in such a manner that an upper surface of the doped polycrystalline silicon plug is exposed,

wherein a residence time of the etching gas within an etching chamber is set at 100 to 200 ms.

39. (currently amended) A fabrication method of a semiconductor integrated circuit device, comprising the steps of:

(a) depositing a silicon oxide insulating film over a patterned silicon nitride film with a doped polycrystalline silicon plug over a semiconductor substrate;

(b) forming a hard mask over said silicon oxide film; and

(c) subjecting the semiconductor substrate to a plasma etching treatment through the hard mask as an etching mask using an etching gas containing a fluorocarbon gas, oxygen and a dilution gas to process said silicon oxide insulating film, so as to form a hole in said silicon oxide insulating film down to the patterned silicon nitride film in such a manner that an upper surface of the doped polycrystalline silicon plug is exposed,

wherein a pressure within the etching chamber during the plasma etching ranges from 0.7 to 7 Pa and a total flow rate of the etching gas passed into the etching chamber is 700 cm<sup>3</sup>/minute or over.

40. (currently amended) A fabrication method of a semiconductor integrated circuit device, comprising the steps of:

(a) depositing a silicon oxide insulating film over a patterned silicon nitride film with a doped polycrystalline silicon plug over a semiconductor substrate;

(b) forming a hard mask over said silicon oxide film; and

(c) subjecting the semiconductor substrate to a plasma etching treatment through the hard mask as an etching mask using an etching gas containing a fluorocarbon gas, oxygen and a dilution gas to process said

silicon oxide insulating film, so as to form a hole in said silicon oxide insulating film down to the patterned silicon nitride film in such a manner that an upper surface of the doped polycrystalline silicon plug is exposed,

wherein a pressure within the etching chamber during the plasma etching ranges from 1.3 to 4 Pa and a total flow rate of the etching gas passed into the etching chamber is 700 cm<sup>3</sup>/minute or over.